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suspicion of systematic errors." It would be of great interest if Mr. Stone would point out his objections to the method I have described and to the tests I have proposed.

Royal Observatory,
Cape of Good Hope:
1883, *March* 6.

On the Position of λ Ursæ Minoris. By John Tatlock, Jun.

(*Communicated by Prof. T. H. Safford.*)

The present paper is intended as a continuation of the paper published under the same title by Prof. T. H. Safford in the *Monthly Notices* for June 1878.

This paper takes up the subject where Prof. Safford left off, and has been prepared, under his direction, according to the method and formulæ given by him in Vol. IV., Part 1, of the Annals of the Observatory of Harvard College, where he has given a similar discussion of this star, based on the data accessible in 1862.

The method given in the foregoing publication, and used in this discussion, is as follows: Let η be the correction to the assumed A.R. for 1855·0; η' the correction for n years to the assumed proper motion in A.R.; i the correction to the assumed Dec. for 1855·0; and i' the correction for n years to the assumed proper motion in Dec. In this discussion we have assumed $n=30$.

Also let α' and δ' be the star's A.R. and Dec. for the time $t+1855$, referred to the coordinate planes of 1855, δ the star's Dec. at the time t referred to the planes of 1855, ξ the angle at the star, used in referring the proper motion for 1855 to the planes of $t+1855$, and ω and ω' the weight in A.R. and Dec. respectively. Now making

$$\frac{\eta}{15}=w, \quad \frac{\eta'}{15}=x, \quad i=y, \quad i'=z,$$

and also in A.R.,

$$a=\sqrt{\omega}\,15\cos\delta\cos\xi$$

$$b=a\,\frac{t-1855}{30}$$

$$c=\sqrt{\omega}\sin\xi$$

$$d=c\,\frac{t-1855}{30}$$

$$v=\sqrt{\omega}\,\Delta\alpha'\cos\delta',$$

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taking $\Delta\alpha'$ in the sense $c-o$, and in Dec.,

$$\begin{aligned} a &= -\sqrt{\omega'}\;15\cos\delta\sin\xi \\ b &= a\,\frac{t-1855}{30} \\ c &= \sqrt{\omega}\cos\xi \\ d &= c\,\frac{t-1855}{30} \\ v &= \sqrt{\omega'}\;\Delta\delta'\;(c-o), \end{aligned}$$

we shall have the form of the equation of condition as follows:—

$$0 = v + aw + bx + cy + dz$$

In Prof. Safford's paper in the *Monthly Notices* he has marked some of the values of $\Delta\alpha'\cos\delta'$ and $\Delta\delta'$ as derived at second-hand from the investigations of others. In the present paper these values have been verified by reference to the authorities themselves. In one or two cases the authorities cited in Prof. Safford's paper have been replaced by a newer or more complete discussion. For instance, Auwers's reduction of Bradley has been used instead of the value given in Prof. Safford's paper, and Rogers 1875 has been substituted for Rogers 1872, as it includes the latter.

The "observed" positions have sometimes been formed by the combination of the results for two or more years, notably in the case of the Greenwich and Radcliffe Catalogues. In all such cases the proper motion from the epoch of the Catalogue place to the epoch of the "observed" place has been applied.

The following table gives the values of $\Delta\alpha'\cos\delta'$ and $\Delta\delta'$, which have been used, in addition to the values given in Prof. Safford's paper:—

Catalogue.	$\Delta\alpha'\cos\delta'$	$\Delta\delta'$	Weights
Bradley 1755	+0″·09	−1″·26	1, 1
Struve 1815	−0·15		1
Schwerd 1828	+0·16	+0·02	2, 2
Radcliffe 1860	−0·21	+0·62	1, 1
Radcliffe 1867	−0·64	+0·29	½, 4
Rogers 1875	+0·15	−0·35	3, 2
Airy 1878	+0·06	−0·12	3, 4
Airy 1880	+0·22	−0·04	3, 4

Treating the resulting equations of condition, 56 in number, by the method of least squares, we find the following system of normal equations:—

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$$
\begin{aligned}
6\cdot5768w-0\cdot9431x-0\cdot0050y+0\cdot2427z+0\cdot2280&=0\\
-0\cdot9431w+3\cdot5262x-0\cdot2552y-0\cdot0990z-0\cdot4326&=0\\
-0\cdot0050w+0\cdot2552x+89\cdot5932y-6\cdot0503z+8\cdot4199&=0\\
0\cdot2427w-0\cdot0990x-6\cdot0503y+37\cdot1541z-1\cdot1937&=0
\end{aligned}
$$

The final equations are

$$
\begin{aligned}
w-0\cdot1434x-0\cdot0008y+0\cdot0369z+0\cdot0347&=0\\
x+0\cdot0750y-0\cdot0189z-0\cdot1179&=0\\
y-0\cdot0675z+0\cdot0940&=0\\
z-0\cdot0175&=0
\end{aligned}
$$

The solution of which gives the following values of the unknown quantities.

$$
\begin{aligned}
w&=-0^{\mathrm{s}}\cdot017\\
x&=-0\cdot124\\
y&=-0\cdot083\\
z&=-0\cdot018
\end{aligned}
$$

The assumed position for 1855·0 is $\alpha=20^{\mathrm{h}}\ 8^{\mathrm{m}}\ 30^{\mathrm{s}}\cdot200$ and $\delta=88^{\circ}\ 52'\ 32''\cdot30$, and the values of the proper motion are $-0^{\mathrm{s}}\cdot073$ and $+0''\cdot01$ in A.R. and Dec. respectively. Applying the corrections which we have found, the corrected places for 1855·0 are

$$
\begin{aligned}
\alpha&=20^{\mathrm{h}}\ 8^{\mathrm{m}}\ 30^{\mathrm{s}}\cdot183\\
\delta&=88^{\circ}\ 52'\ 32''\cdot22
\end{aligned}
$$

And the corrected values of the proper motion are, in A.R.,

$$-0^{\mathrm{s}}\cdot069\,;$$

in Dec.,

$$+0''\cdot0106$$

From these elements the position for 1885·0, without proper motion, is

$$
\begin{aligned}
\alpha&=19^{\mathrm{h}}\ 38^{\mathrm{m}}\ 57^{\mathrm{s}}\cdot705\\
\delta&=88^{\circ}\ 57'\ 19''\cdot34
\end{aligned}
$$

And the amount of proper motion is

$$
\begin{aligned}
\Delta\alpha&=-2^{\mathrm{s}}\cdot365\\
\Delta\delta&=+0''\cdot233
\end{aligned}
$$

Hence the position for 1885·0 is

$$
\begin{aligned}
\alpha&=19^{\mathrm{h}}\ 38^{\mathrm{m}}\ 55^{\mathrm{s}}\cdot340\\
\delta&=88^{\circ}\ 57'\ 19''\cdot57
\end{aligned}
$$

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Dr. Auwers gives for the same epoch,

$$\alpha = 19^{\rm h}\ 38^{\rm m}\ 55^{\rm s}{\cdot}704$$

$$\delta = 88^{\circ}\ 57'\ 19'{\cdot}46$$

Field Memorial Observatory, Williams College,
Williamstown, Mass., U.S.A.:
1883, *Feb.* 21.

Measures of the Companion to Sirius. By S. W. Burnham.

My measures of the companion to *Sirius*, made on ten nights during the present season with the 18½-in. Refractor of the Dearborn Observatory, are as follows:—

1882·988	40°·6	9″·16
83·000	40·3	9·27
83·074	41·1	8·99
83·107	39·9	9·02
83·115	39·8	9·17
83·134	40·1	8·90
83·137	38·1	9·17
83·151	41·0	8·92
83·153	40·6	8·91
83·159	39·6	8·86
Mean = 1883·10	40·1	9·05

Chicago:
1883, *March* 30.

Observations of Comet c, 1881 (*Schäberle*), *made at the Cambridge Observatory with the Northumberland Equatorial and Square-bar Micrometer.*

(*Communicated by Prof. J. C. Adams, M.A., F.R.S.*)

Green. M.T.	Aberration Time.	App. R.A.	Parallax.	App. Decl.	Parallax.	Comp. Star.	No. of Comp.
1881.		h m s	s	° ′ ″	″		
Aug. 24·35221	−·00332	11 59 49·113	+0·782	+37 19 33·28	+10·67	*a*	3
24·37579	−·00332	12 0 12·808	0·752	37 14 52·32	11·49	*a*	5
26·34636	−·00335	12 30 21·228	0·729	30 38 14·45	10·58	*b*	7
26·36421	−·00336	12 30 36·054	0·720	30 34 25·38	11·12	*b*	6
,,	,,	36·027	,,	24·77		*c*	6
27·37251	−·00339	12 43 46·641	0·686	27 4 55·38	11·30	*d*	11